DIO7982
Ultra-Low I_Q 150mA CMOS LDO Regulator

Features

- Operating Input Voltage Range: 1.8 V to 5.5 V
- Output Voltage Range: 1.2 V to 3.6 V
- Ultra-Low Quiescent Current Typ. 0.5 μA
- Low Dropout: 170 mV Typ. at 150 mA
- High Output Voltage Accuracy ±1%
- Stable with Ceramic Capacitors 1 μF
- Over-Current Protection
- Thermal Shutdown Protection
- DIO7982A for Active Discharge Option
- Available in Small DFN1*1-4 and SOT23-5 Packages
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

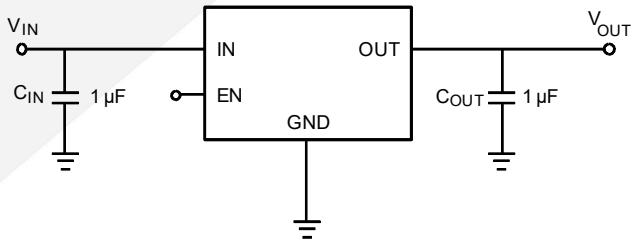
Applications

- Battery Powered Equipment
- Portable Communication Equipment
- Cameras, Image Sensors and Camcorders

Descriptions

The DIO7982 series of CMOS low dropout regulators are designed specifically for portable battery-powered applications which require ultra-low quiescent current. The ultra-low consumption of typ. 500nA ensures long battery life and dynamic transient boost feature improves device transient response for wireless communication applications. The device is available in DFN1*1-4 and SOT23-5 packages.

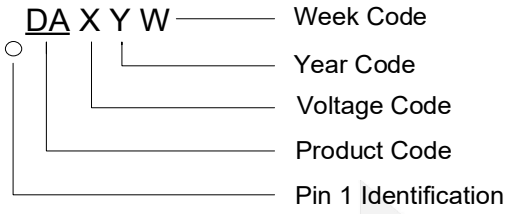
Typical Applications

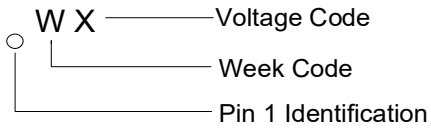


Ordering Information

Order Part Number	Top Marking		T_A	Package	
DIO7982A12ST5	DAFYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A15ST5	DAGYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A18ST5	DAHYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A25ST5	DAJYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A28ST5	DAKYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A30ST5	DAMYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A33ST5	DANYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A36ST5	DAPYW	Green	-40 to +85°C	SOT23-5	Tape & Reel,3000
DIO7982A12EN4	WF	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A15EN4	WG	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A18EN4	WH	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A25EN4	WJ	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A28EN4	WK	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A30EN4	WM	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A33EN4	WN	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000
DIO7982A36EN4	WP	Green	-40 to +85°C	DFN1*1-4	Tape & Reel,10000

Marking Definition

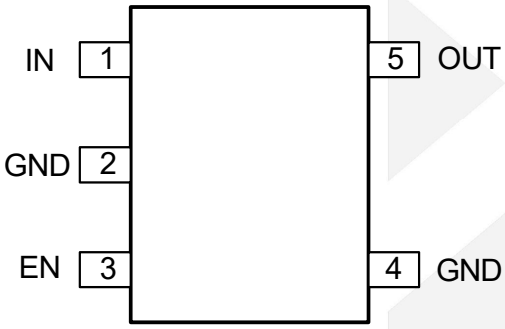




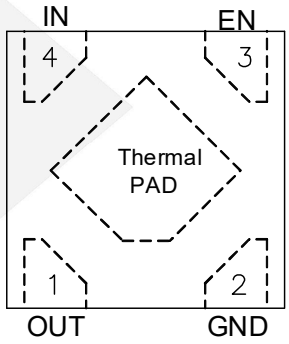
Voltage Code

X	F	G	H	J	K	M	N	P
Voltage	1.2V	1.5V	1.8V	2.5V	2.8V	3V	3.3V	3.6V

Pin Assignments



SOT23-5



DFN1*1-4

Figure 1 Pin Assignment (Top View)

Pin Definitions

Pin Name	Description
OUT	Output Voltage Pin.
EN	Enable Pin. This pin has an internal pull-down resistor. A logic low reduces the supply current to less than 1μA. Connect to logic “High” for normal operation.
GND	Power Supply Ground.
IN	Input Voltage Pin.

Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Rating” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maxim rating conditions for extended periods may affect device reliability.

Parameter		Rating	Unit
Input Voltage V_{IN}		6.0	V
Output Voltage V_{OUT}		-0.3 to V_{IN}+0.3	V
Chip Enable Input V_{CE}		-0.3 to 6.0	V
Maximum Junction Temperature $T_{J(MAX)}$		150	°C
Storage Temperature T_{STG}		-55 to 150	°C
Thermal Resistance	DFN1*1-4	250	°C/W
	SOT23-5	190	
ESD	HBM	8000	V
	MM	200	

Electrical Characteristics – Voltage Version 1.2V

V_{IN} = 2.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF,-40°C≤ T_A ≤85°C,Typical values are at T_A = 25°C, unless otherwise specified.

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{IN}	Operating Input Voltage			1.8		5.5	V
V_{OUT}	Output Voltage	T_A= +25°C		1.188	1.2	1.212	V
		-40°C≤ T_A ≤85°C		1.176	1.2	1.224	
$Line_{Reg}$	Line Regulation	2.5V < V_{IN} ≤ 5.5V， I_{OUT}=1mA			0.05	0.20	%/V
$Load_{Reg}$	Load Regulation	0mA < I_{OUT} ≤ 150mA， V_{IN}=2.5V		-20	1	20	mV
V_{DO}	Dropout Voltage				-		
I_{OUT}	Output Current			150			mA
I_{SC}	Short Circuit Current Limit	V_{OUT}=0V			130		mA
I_Q	Quiescent Current	I_{OUT}=0mA			0.5	0.9	μA
I_{STB}	Standby Current	V_{EN}=0V			0.1	0.5	μA
V_{ENH}	EN Pin Threshold Voltage	EN Input Voltage “H”		1.0			V
V_{ENL}	EN Pin Threshold Voltage	EN Input Voltage “L”				0.4	V
I_{EN}	EN Pin Current	V_{EN} ≤ V_{IN} ≤ 5.5V			10		nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=2.2V + 200mVpp Modulation	I_{OUT}=150mA		57		dB
			I_{OUT}=10mA		63		dB
V_{NOISE}	Output Noise Voltage	V_{IN}=5.5V, I_{OUT}=1mA, f=100Hz to 1MHz, C_{OUT}=1μF			85		μVrms
R_{LOW}	Active Output Discharge Resistance	V_{IN}=5.5V, V_{EN}=0V			100		Ω
T_{SD}	Thermal Shutdown Temperature	Temperature Increasing from T_A= +25°C			160		°C
T_{SDH}	Thermal Shutdown Hysteresis	Temperature Falling from T_{SD}			25		°C

Electrical Characteristics – Voltage Version 1.8V

V_{IN} = 2.8V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF,-40°C≤ T_A ≤85°C,Typical values are at T_A = 25°C, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Operating Input Voltage		1.8		5.5	V
V_{OUT}	Output Voltage	T_A= +25°C	1.782	1.8	1.818	V
		-40°C≤ T_A ≤85°C	1.764	1.8	1.836	
$Line_{Reg}$	Line Regulation	2.8V < V_{IN} ≤ 5.5V， I_{OUT}=1mA		0.05	0.20	%/V
$Load_{Reg}$	Load Regulation	0mA < I_{OUT} ≤ 150mA， V_{IN}=2.8V	-20	1	20	mV
V_{DO}	Dropout Voltage	I_{OUT}=150mA		350	480	mV
I_{OUT}	Output Current		150			mA
I_{SC}	Short Circuit Current Limit	V_{OUT}=0V		130		mA
I_Q	Quiescent Current	I_{OUT}=0mA		0.5	0.9	μA
I_{STB}	Standby Current	V_{EN}=0V		0.1	0.5	μA
V_{ENH}	EN Pin Threshold Voltage	EN Input Voltage “H”	1.0			V
V_{ENL}	EN Pin Threshold Voltage	EN Input Voltage “L”			0.4	V
I_{EN}	EN Pin Current	V_{EN} ≤ V_{IN} ≤ 5.5V		10		nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=2.8V + 200mVpp Modulation, I_{OUT}=150mA		57		dB
V_{NOISE}	Output Noise Voltage	V_{IN}=5.5V, I_{OUT}=1mA, f=100Hz to 1MHz, C_{OUT}=1μF		95		μVrms
R_{LOW}	Active Output Discharge Resistance	V_{IN}=5.5V, V_{EN}=0V		100		Ω
T_{SD}	Thermal Shutdown Temperature	Temperature Increasing from T_A= +25°C		160		°C
T_{SDH}	Thermal Shutdown Hysteresis	Temperature Falling from T_{SD}		25		°C

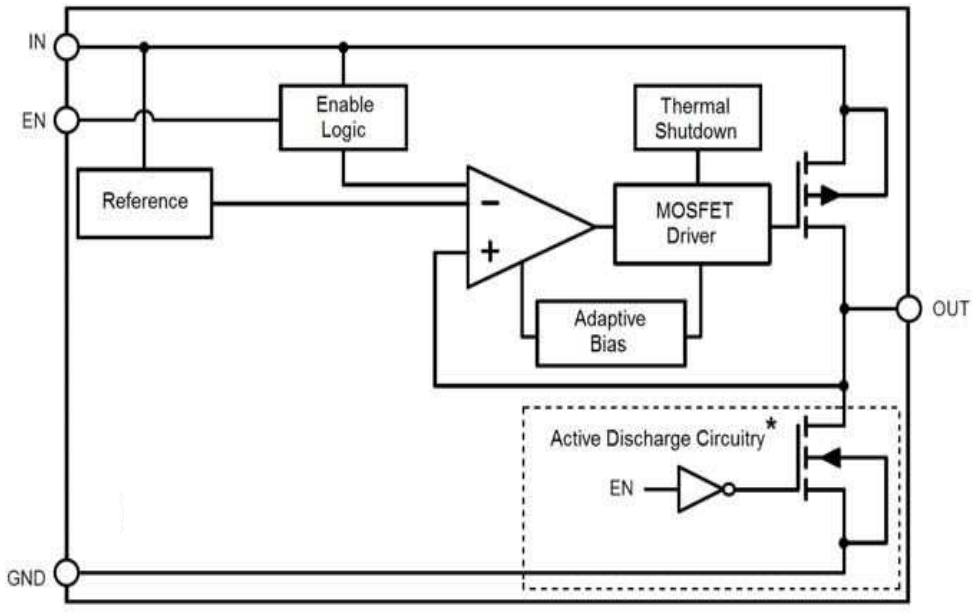
Electrical Characteristics – Voltage Version 3.3V

V_{IN} = 4.3V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF,-40°C≤ T_A ≤85°C, Typical values are at T_A = 25°C, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Operating Input Voltage		1.8		5.5	V
V_{OUT}	Output Voltage	T_A= +25°C	3.267	3.3	3.333	V
		-40°C≤ T_A ≤85°C	3.234	3.3	3.366	
$Line_{Reg}$	Line Regulation	4.3V < V_{IN} ≤ 5.5V， I_{OUT}=1mA		0.05	0.20	%/V
$Load_{Reg}$	Load Regulation	0mA < I_{OUT} ≤ 150mA， V_{IN}=4.3V	-20	1	20	mV
V_{DO}	Dropout Voltage	I_{OUT}=150mA		180	250	mV
I_{OUT}	Output Current		150			mA
I_{SC}	Short Circuit Current Limit	V_{OUT}=0V		130		mA
I_Q	Quiescent Current	I_{OUT}=0mA		0.5	0.9	μA
I_{STB}	Standby Current	V_{EN}=0V		0.1	0.5	μA
V_{ENH}	EN Pin Threshold Voltage	EN Input Voltage “H”	1.0			V
V_{ENL}	EN Pin Threshold Voltage	EN Input Voltage “L”			0.4	V
I_{EN}	EN Pin Current	V_{EN} ≤ V_{IN} ≤ 5.5V		10		nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=4.3V + 200mVpp Modulation, I_{OUT}=150mA		41		dB
V_{NOISE}	Output Noise Voltage	V_{IN}=5.5V, I_{OUT}=1mA, f=100Hz to 1MHz, C_{OUT}=1μF		125		μVrms
R_{LOW}	Active Output Discharge Resistance	V_{IN}=5.5V, V_{EN}=0V		100		Ω
T_{SD}	Thermal Shutdown Temperature	Temperature Increasing from T_A= +25°C		160		°C
T_{SDH}	Thermal Shutdown Hysteresis	Temperature Falling from T_{SD}		25		°C

Specifications subject to change without notice.

Block Diagram



Applications Information

General

The DIO7982 is a high performance 150mA Linear Regulator with Ultra Low IQ. This device delivers low Noise and high Power Supply Rejection Ratio with excellent dynamic performance due to employing the Dynamic Quiescent Current adjustment which assure ultra low IO consumption at no-load state. These parameters make this device very suitable for various battery powered applications.

Input Decoupling (C_{IN})

It is recommended to connect at least a 1μF Ceramic X5R or X7R capacitor between IN and GND pins of the device. This capacitor will provide a low impedance path for any unwanted AC signals or Noise superimposed onto constant input voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes.

Higher capacitance and lower ESR capacitors will improve the overall line transient response.

Output Decoupling (C_{OUT})

The DIO7982 does not require a minimum Equivalent Series Resistance (ESR) for the output capacitor. The device is designed to be stable with standard ceramics capacitors with values of 1.0μF or greater up to 10μF. The X5R and X7R types have the lowest capacitance variations over temperature thus they are recommended. There is recommended connect the output capacitor as close as possible to the output pin of the regulator.

Enable Operation

The DIO7982 uses the EN pin to enable/disable its device and to activate / deactivate the active discharge function at devices with this feature. If the EN pin voltage is pulled below 0.4V the device is guaranteed to be disable. The active discharge transistor at the devices with active discharge feature is activated and the output voltage VOUT is pulled to GND through an internal circuitry with effective resistance about 100ohms.

If the EN pin voltage is higher than 1.0V the device is guaranteed to be enabled. The internal active discharge circuitry is switched off and the desired output voltage is available at output pin. In case the enable function is not required the EN pin should be connected directly to input pin.

Thermal Shutdown

When the die temperature exceeds the Thermal Shutdown point (T_{SD}=160°C typical) the device goes to disabled state and the output voltage is not delivered until the die temperature decrease to 160°C. The Thermal Shutdown feature provides a protection from a catastrophic device failure at accidental overheating. This protection is not intended to be used as a substitute for proper heat sinking.

Power Dissipation and Heat Sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material, and the ambient temperature affect the rate of junction temperature rise for the part. The maximum power dissipation the DIO7982 device can handle is given by:

$$P_{D(MAX)} = \frac{[T_{J(MAX)} - T_A]}{R_{\theta JA}}$$

The power dissipated by the DIO7982 device for given application conditions can be calculated from the following equations:

$$P_D \approx V_{IN}\left(I_{GND}(I_{OUT})\right) + I_{OUT}\left(V_{IN} - V_{OUT}\right)$$

Or

$$V_{IN(MAX)} \approx \frac{P_{D(MAX)} + (V_{OUT} \times I_{OUT})}{I_{OUT} + I_{GND}}$$

Hints

VIN and GND printed circuit board traces should be as wide as possible. When the impedance of these traces is high, there is a chance to pick up noise or cause the regulator to malfunction. Place external components, especially the output capacitor, as close as possible to the DIO7982, and make traces as short as possible.

CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as, cell phone, handheld products, laptop, and medical equipment and so on. Dioo's product families include analog signal processing and amplifying, LED drivers and charger IC. Go to http://www.dioo.com for a complete list of Dioo product families.

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